GE 348

ENGINEERING ECONOMICS

MIDTERM

FEBRUARY, 1997

- Open textbook
- One 8 ½" x 11" sheet of notes
- Neatness counts a lot!
- Show all work in design note format

Question	Marks	Marks Obtained
1	10	10
2	10	10
3	15	15
4	15	10
5	25	25
6	25	25
	100%	95

4

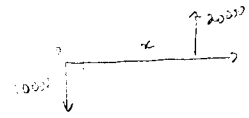
NAME: Reid Jon Melle

STUDENT #: =200616

Exam File Provided By
The UofS IEEE Student Branch
ieee.usask.ca
IEEE

1. At an interest rate of amount?

(10)



and get PW = 0

Solve $P_1(1+i)^n = P_2$

$10000(1+0.05)^n = 20000$

$(1.05)^n = 2 \qquad n \ln(1.05) = \ln 2$

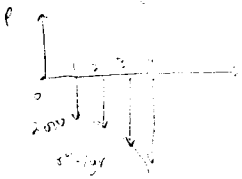
$n = 9.01$ years

9.01

Answer

2. Tuition costs are expected to inflate at the rate of 8 percent per year. The first year's tuition is due 1 year from now and will be $2000. A fund is to be set up today to cover tuition costs for 4 years in an account that will earn interest at rate i. How large must the fund be if $i = 5\%$?

(10)



note: P is a payment into the fund while tuition is a payment out

Solve: set PW=0 $\qquad P - A\left[\frac{1-(1+i)^{-n}}{i}\right] = 0$

$P = 2000\left[\frac{1-(1+0.05)^{-4}}{0.05}(1+0.05)^{-4}\right]$

$P = 7951.84$

7951.84

Answer

Name: [illegible]

Student Number: [illegible]

3. For a finance charge stated as 1.75 percent per month, what are the corresponding nominal and effective interest rates?

(15)

nominal rate = $(1.75)\times 12 = 21\%$

effective rate = $(1+i/r)^r - 1 = (1+0.0175)^{12} - 1 = 23.14\%$

nominal: 21%

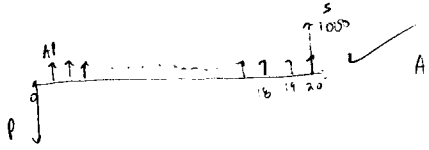
effective: 23.14%

a)	21.0%
b)	23.14%

Answer

4. A 10-year corporate bond has a face value of $1000 and a coupon rate of 8 percent payable semiannually. A prospective buyer desires to earn a nominal rate of 12 percent on investments. What purchase price would the buyer be willing to pay?

(15)



Annual payment: $A = 1000\left(\frac{0.08}{2}\right) = 40$

set PW = 0 to find breakeven at MARR = 12%

$-P + A\left[\frac{(1+i)^n - 1}{i(1+i)^n}\right] + F(1+i)^{-n} = 0$

$-P - 40\left[\frac{(1+0.06)^{20} - 1}{0.06(1+0.06)^{20}}\right] + 1000(1+0.12)^{-10} = 0$

$P = 780.77$

40

780.77

Answer

Name: [illegible]

Student Number: [illegible]

5.

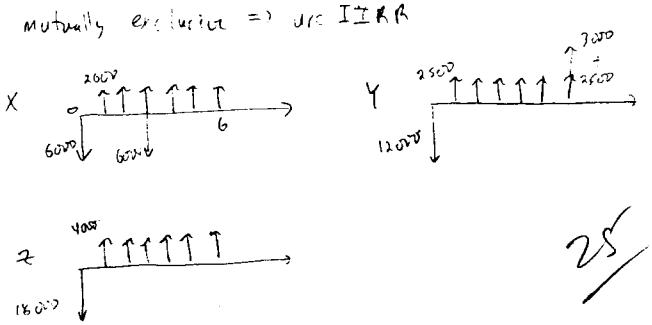
Data for three alternative investment plans are listed below.

Alternative	Investment	Salvage Value	Life, Years	Annual Net Cash Flow
X	$ 6,000	$ 0	3	$2600
Y	12,000	3000	6	2500
Z	18,000	0	6	4000

When the minimum attractive rate of return is 10 percent, which alternative should be selected if the individual alternatives are mutually exclusive?

(25)

Mutually exclusive $\Rightarrow$ use IIRR



25

set PW = 0 in all cases

$IRR_{0\to X}$: $-6000 + 2600\left[\frac{(1+i)^6 - 1}{i(1+i)^6}\right] - 6000(1+i)^{-3} = PW$

try $i = 10\%$ $PW = 815.79$ $\therefore$ $IIRR_{0\to X}$ is $>$ MARR so <u>fail</u>

$IRR_{X\to Y}$: $-6000 - 100\left[\frac{(1+i)^6 - 1}{i(1+i)^6}\right] + 6000(1+i)^{-3} + 3000(1+i)^{-6} = PW$

try $i = 10\%$ $PW = -234.22 < 0$ $\therefore$ $IIRR_{X\to Y}$ is $<$ MARR so <u>keep X</u>

$IRR_{X\to Z}$: $-12000 + 1400\left[\frac{(1+i)^6 - 1}{i(1+i)^6}\right] + 6000(1+i)^{-3} = PW$

try $i = 10\%$ $PW = -1394.75 < 0$

$\therefore$ $IIRR_{X\to Z}$ < MARR so keep X

X

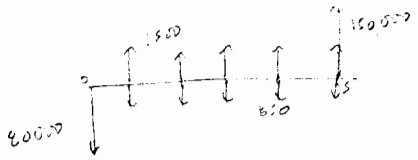
Answer

Name: Paid van Mille

Student Number: 200616

6. A parcel of land adjacent to a proposed highway exit is deemed likely to increase in value. It can be purchased now for $80,000 and is expected to be worth $150,000 within 5 years. During that period it can be rented for pasture at $1500 per year. Annual taxes are presently $850 and will likely remain constant. What rate of return will be earned on the investment if the estimates are accurate?

(25)



Find rate of return

set PW = 0 if possible

25

annual income = 1500 - 650 = 650

$-80\,000 + 650\,P(P/A, i, 5) + 150\,000\,P(P/F, i, 5) = PW$

$-80\,000 + 650\left[\frac{(1+i)^5 - 1}{i(1+i)^5}\right] + 150\,000\,(1+i)^{-5} = PW$

try i = 20% PW = negative

try i = 10% PW = positive

note solve $-80\,000 + 150\,000\,(1+i)^{-5} = 0$ first as a guess

$\Rightarrow$ i = 13.4 %

try i = 13.4 % PW = positive

try i = 13.5 % PW = positive

try i = 13.7 % PW = positive

try i = 14 % PW = 134.6

try i = 14.1 % PW = -20.

14 %

Answer

Name: Paid van Mille

Student Number: 200616

Bonus Question - Wealthy Barber

5% In point form, outline the principles recommended in the Wealthy Barber to financial independence.

✓

- Dollar cost averaging - buy with same amount of money
- Forced savings ✓ get money taken out of account directly
- Insurance - only keep enough to sustain standard of living
  - don't keep any if you're single
  - decrease as you get old
- Real-estate is always a good long-term investment
- START EARLY ✓
- Always have a will
- Invest 10% of everything you make ✓
- Pay yourself first ✓
- Mutual fund are good and worth doing research into
- Equity outpays debt ✓ invest in a company rather than loan more
- Pay off high interest debts like credit cards ✓ this is equivalent to making a good investment

4